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Institutional pathways to municipal energy companies in the UK: realising co-benefits to mitigate climate change in cities

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Abstract

Municipalities in the UK are increasingly engaging in local management of one or more parts of the energy system. The municipal energy companies set up to manage this engagement have the potential to contribute to a low-carbon transition through acceleration of low-carbon energy technology roll-out and demand management. However, municipal energy companies face many constraints that limit their growth in number and scale and restrict their potential to contribute to climate change mitigation. This paper aims to develop a better understanding of why and how municipal energy companies form to help to identify how policy and regulation could better support their proliferation and their contribution to climate change mitigation. We conducted a longitudinal analysis (from 2013–2017) of five UK cities' attempts to develop new institutional arrangements to engage in the national energy system and contribute to climate change mitigation. We found that the fundamental purpose of municipal energy companies was different to those of the private sector; using energy to deliver essential services and place-specific outcomes, rather than aiming to deliver energy at least cost. The scope of engagement was dependent on a city's unique characteristics and factors driving decisions. We found that there was no blueprint for a municipal energy company, rather the final form was shaped by a city's unique characteristics and decision drivers and emerged from a process of experimentation and learning. This 'pathway' towards a municipal energy company is also heavily influenced by the changing policy context, meaning that studying the evolution of MECs over time is very important. Specific changes in UK policy have significantly reduced the potential of MECs to contribute to carbon emissions reduction. We propose a framework of characteristics, decision drivers and pathways to better understand the evolution of MECs and to support the identification of policy and regulation that could enable their proliferation. We illustrate the application of this framework to maximise the contribution of MECs to climate change mitigation in cities. We identified a need for policy to recognize and enable different institutional drivers (including climate change) and institutional forms and encourage experimentation. Furthermore, new approaches to accounting and valuation are needed that capture social and environmental outcomes and outcomes that occur in the long-term.

1 Introduction

In order to provide secure and affordable energy services and avoid dangerous climate change, the UK needs rapid, systemic transformation of its energy systems to decarbonise generation and reduce demand (Hall et al. 2012). The prevalent mode of energy-system operation in the UK is based on large utility companies selling units of energy to customers. Profits are increased by selling more

units and by making marginal efficiency savings. This disincentivises both the adoption of low carbon technologies and the necessary scale of demand reduction (Roelich et al. 2015).

Alternative modes of operation are emerging where energy infrastructure services are supplied by non-traditional providers, motivated by goals other than profit (Hall and Roelich 2016). In this paper we focus in particular on the potential for municipalities to locally manage one part (or more) of the energy system and for this local management to deliver carbon emissions reductions. We define 'municipal energy companies' as any municipality-led initiative that involves direct supply of energy (heat or electricity), or ownership and/or management of energy infrastructure. These 'municipal energy companies' could deliver a wider range of benefits, such as fuel poverty reduction and economic growth, as well as contributing to a low-carbon transition through acceleration of low-carbon technology roll-out and demand management (Roelich and Bale 2014).

Despite their potential contribution to energy system transitions, municipal energy companies (MECs) face many constraints. These limit their growth in number and scale and restrict their potential to contribute to climate change mitigation. Some of the most significant constraints stem from a mismatch between policy and regulatory systems built around the characteristics of the private sector (where decisions relate to providing energy at least cost and carbon) and the characteristics of cities (where decisions relate to providing benefits to citizens at least risk). This paper aims to develop a better understanding of why and how cities are attempting to develop MECs to help to identify how policy and regulation could better support their proliferation and their contribution to climate change mitigation. We aim to address the following research questions:

1. What are the characteristics of cities that are pursuing municipal energy companies in the UK?
2. What factors are driving the decision to develop MECs?
3. How are cities implementing MECs?
4. How can national policy better support the development of MECs to bring forward climate change mitigation in cities?

This paper is structured as follows; the rest of section 1 introduces energy infrastructure and governance in the UK to provide the necessary background to later analysis. Section 2 provides a survey of literature relevant to the aim of this paper to understand the evolution of MECs and their potential contribution to carbon emissions reductions. Section 3 outlines the methods and section 4 presents the results of our analysis. Section 5 presents a framework to support a better understanding of development of MECs and illustrates how this framework can be used to identify how national policy could better support MECs and to maximise their contribution to climate change mitigation in cities. We conclude with the wider policy implications of the research.

1.1 Energy infrastructure in the UK

In the early 20th century, energy was provided in the UK at a municipal level by a range of public and private actors, including municipalities (Fouquet and Pearson 1998). Energy systems were small and localised, and evolved to serve specific users and locations (Hughes 1983). The 1920s saw the start of a phase of standardisation and centralisation to improve economies of scale, including development of the national grid, and the UK energy system was nationalised in the late 1940s (National Grid 2005). Energy remained within state hands until the late 1980s when the government of the time started a process of privatisation. During the 1990s, generation and supply were separated and the retail markets were liberalised to enable competition for both electricity and gas.

Despite this, both generation and supply are dominated by large international energy companies, who currently supply over 86% of electricity and gas in the UK (Ofgem 2016). The transmission network, which transports power from generation to sub-stations, was also privatised but is operated as a regulated monopoly by National Grid. Electricity is transported from substations through regional distribution network to end-users by distribution network operators (DNOs). Generators and suppliers pay a charge for the use of the transmission and distribution systems respectively.

This model has served the UK well by delivering operational efficiency, but has limited potential to address climate change and affordability. There is increasing evidence that a move towards decentralisation of the energy system, (both in terms of technology and governance) could result in national infrastructure performance increases (Hall et al. 2012). This opens the way for municipal engagement in the energy system (RTP Engine Room 2015).

1.2 Energy governance in the UK

Energy policy and regulation in the UK has coevolved with changes in the physical infrastructure system and in the politics of successive governments (Pearson and Watson 2012). For example, one of the major changes in infrastructure operation, privatisation and liberalisation, stems from the political philosophy of the government at the time that the private sector is better placed to find efficiencies. There is increasing recognition that the original aim of privatisation, to create an energy market that operates with a minimum distortion and which ensures that energy is produced and consumed efficiently, is unachievable (Pearson and Watson 2012). Nevertheless, regulation that mimics or promotes competition remains the principal means through which the customer is protected in current regulation (Mitchell and Woodman 2010). The freedom of energy customers to switch suppliers is protected and recent changes in regulation have aimed to make it simpler and faster to switch suppliers and limit the ability of suppliers to lock customers into long-term agreements.

There is a close connection between energy supply and system balancing functions in the UK. Therefore, regulation requires that energy suppliers must engage with complex trading and reporting systems and demonstrate significant technical and financial resource before being granted a licence to supply (Hall and Roelich 2015). New trading rules were introduced in 2014 intending to improve transparency and reduce barriers for smaller, independent suppliers (Ofgem 2014). These changes have made it easier for new suppliers, including municipalities, to enter the market and there has been a noticeable increase in the number of energy suppliers from 12 in 2010 to 48 in 2016 (Ofgem 2017).

The envisaged reduced government intervention in the energy market has not transpired and additional policies have been required to stimulate uptake of low carbon technologies (including renewables obligations and feed in tariffs) and energy efficiency (including energy efficiency obligations and a 'pay-as-you-save' scheme). These policies have encouraged a spate of small-scale generation and demand reduction projects, including municipality-led projects, which relied on income from FITs and energy efficiency obligations for financial viability. However, policy support for both low-carbon generation and energy efficiency reduced dramatically in 2015 after the election of a Conservative majority, which has had significant implications for the financial case for many planned projects (DECC 2011, DECC 2013, Rosenow and Eyre 2016).

2 Literature review

2.1 Conceptualising sustainable energy transitions in cities

It is now widely agreed that cities have an important part to play in a sustainable energy transition, with municipalities increasingly positioned as significant contributors to sustainable energy transitions within European and UK policy (IEA 2009). What capacity and capability cities currently have in this area is, however, still uncertain (Webb et al. 2016). Cities are imagined as important intermediaries, but lack of direct government powers over the UKs centrally regulated, privatised energy system means that they struggle to constitute a legitimate space and rationale for larger scale intervention (Hodson et al. 2013, Webb et al. 2016).

Whilst a number of cities in the UK are currently engaging with multiple forms of strategic energy planning, as well as individual initiatives and experiments, their approaches are predominantly incremental and piecemeal and many have only limited engagement in energy (Hawkey, Tingey et al. 2014). It is argued that this constitutes only limited contribution to any systemic shifting of obdurate and embedded energy infrastructures organisational patterns, and further of having no measurable impact on carbon emissions (Monstadt and Wolff 2015, Webb et al. 2016)

The literature concerned with the question of sustainable energy transitions has been dominated by Socio Technical Systems theory (STS) and the multilevel perspective (MLP) (Geels 2002, Geels 2004) which have sought to understand transitions primarily in terms of large scale systemic change (Smith et al. 2010). It is, however, increasingly recognised that sustainable energy transitions are more geographically and politically situated than these literatures have previously been able to capture (Shove and Walker 2007, Raven et al. 2016). Recent contributions in this field have argued the need for a better understanding of the inherent discursive, material and institutional politics of innovation spaces for low carbon energy transitions (Raven et al. 2016). Further exploration of how different incremental ('fit-and-conform') or disruptive ('stretch- and-transform') logics are at play in transition processes (Smith and Raven 2012) and further development of a typology of 'local' logic of transition pathways (Geels et al. 2016).

This spatial and political reorientation relates to the growing literature on the geography of sustainability transitions around the question of why transitions appear to occur in one place and not in another (Bridge et al. 2014, Hansen and Coenen 2015). The significance of place specificity and the role of spatial relations in sustainability trajectories and transitions are leading themes in this field (Hansen and Coenen 2015, Castan-Broto 2017), which is increasingly trying to address "the context-specific conditions and the 'nuts and bolts' of socio-technical change, the inevitable inertias, pitfalls and barriers involved in implementing such change, and the resulting winners and losers" (Rutherford and Coutard 2014: 1371).

Recent contributions in this journal have shown how new spatially and politically situated governance structures needed to be developed by heterogeneous groups of actors (Fuchs and Hinderer 2016; Becker et al. 2017). These papers add to growing body of work which argues against a linear understanding of transitions, with greater emphasis on the organisational processes through which municipalities develop sustainable energy and climate strategies (Fenton et al. 2015).

Research focusing on how urban energy transitions are organised, has suggested that there is often significant capacity to act in reconfiguring urban energy systems which remains latent as the appropriate organisational context required has not been developed (Hodson et al. 2013). Creating

better insights into where and by whom urban low-carbon transitions are governed and how different types of horizontal, vertical and infrastructural governance processes combine to drive and constrain low carbon energy transitions are a necessary part of unlocking this latent capacity (Rutherford and Jaglin 2015, Haarstad 2016).

Whilst the often piecemeal and incremental character of the majority of municipal approaches to energy governance has been seen as a lack of strategic governance, Bulkeley et al (2014) have recently argued that in the context of wider climate change this constitutes “a mode of experimentation where municipalities, private and civil society actors seek to demonstrate, learn and challenge what it might mean to respond to climate change through a multiplicity of interventions, projects and schemes” (Bulkeley et al. 2014:5). Interrogating this experimentation in practice involves investigating the manner in which top-level policy aspirations are turned into radical action (Marsden et al. 2014).

Analysis of sustainable energy transitions in cities has tended to underplay the importance of spatial, political and temporal aspects of transitions. This research reported in this paper aims to specifically analyse the influence of spatial, political and temporal factors on the evolution of MECs.

2.2 Implementing municipal energy activities in cities

The particular initiatives and projects through which LAs are engaging or planning to engage with municipal energy differ widely. They can be grouped into three strategies which seen on a scale are; 1) reducing energy costs (e.g. through energy efficiency measures), 2) local generation and 3) intervening in the energy supply market. The majority of municipalities in the UK are already actively working on energy efficiency measures and strategies and many have some form of generation capacity using different technologies and business models. There have been some recent examples of cities entering the energy supply market including Robin Hood Energy (Nottingham) and White Rose Energy (Leeds).

Recent studies have presented detailed case studies of cities developing different forms of municipal energy initiatives (Webb et al. 2016). Certain aspects have been explored in detail such as the decision criteria for energy initiatives (Bale et al. 2012, Polzin et al. 2016), and the difficulty in capturing non-economic benefits (Webb 2015, Hall and Roelich 2016). However, most of this research has been conducted at one point in time, and there is a need for a longitudinal view of the development of municipal energy activities.

There have been calls for further research in this area on “characteristics, benefits and challenges” of energy companies (Hannon and Bolton 2015), as well as the structures of urban energy initiatives (Webb et al. 2016)

To address this research gap, a key aspect of the research reported in this paper is to bring together an understanding of processes of change with an understanding of cities and energy to analyse how MECs have come about and how they could be better supported.

3 Methods

3.1 Data collection

The findings in this paper are based on qualitative data relating to municipal energy activities in UK cities, as these have developed in the period 2013-2017. We draw primarily on 10 semi-structured

interviews with municipality officers responsible for energy at five different Core Cities in the UK¹. Interview questions were developed to ensure that interviewees discussed specific topics, including the cities' motivations for engaging in energy, how they were acting on these motivations (including any specific proposals to set up MECs), and the barriers faced. Five interviews were carried out in 2013/2014 and five follow-up interviews were carried out in 2017.

The follow up interviews repeated questions about cities' motivations and barriers and explored how engagement had developed over time, in order to establish how cities were navigating towards MECs. The opportunity to undertake longitudinal analysis enabled a greater focus on how motivations, aspirations and activities in specific cities has emerged and changed over time and how the dramatically changing external environment had influenced cities motivations, aspirations and activities.

In addition to these interviews, we draw on research conducted under several projects over the period from 2010 until present. In these projects over 30 interviews were conducted with stakeholders in a variety of roles across the energy systems in the UK, including municipalities, energy companies, central government and other public and private sector partners. Additional details of the methods and analysis conducted in this work can be found in associated publications (Bale et al. 2012, Bush et al. 2014, Roelich 2014, Hall and Roelich 2015).

The authors have also participated in informal meetings with municipal stakeholders, providing an insight into the decision-making process within local authorities by using the method of overt participant observation (Jorgensen 1989). This method allowed for detailed information about practices within municipalities to be drawn out, and has allowed the authors to gain insight into the practical challenges cities face when engaging in the energy system.

3.2 Data analysis

Interviews were audio-recorded and transcribed, and a series of categories were defined to enable data coding and support analysis of the qualitative data. These categories were also used to structure the presentation of data in section 4.

Categories of *motivations* and *scope of engagement* were used to identify reasons why cities were engaging in the energy system and the parts of the systems in which they were engaging, in response to research question 2.

Categories of *material*, *political* and *organisational* factors were used to identify the characteristics of a city and how activities were shaped by the geographies and politics of sustainable energy transitions, in response to research question 1. *Material* factors included references to already built infrastructure and local geography (Bridge et al. 2014, Haarstad 2016)). *Political* factors included references to how both local and national politics influenced activities in space and time (Raven et al. 2016). *Organisational* factors included references to how energy activities were organised internally within the different LAs, the degree of cohesion from different levels within the LA and the manner in which capacity to push forward energy company plans was emerging (Hodson et al. 2013, Bulkeley et al. 2014).

Through the process of data analysis it became clear that whilst factors relating to the characteristics of a place provided a useful means of understanding the way in which municipal energy activities were shaped by the locality they did not cover all aspects of data. A further dimension of temporality

¹ The Core Cities is a collaborative group of the ten largest cities outside of London in the UK: Birmingham, Bristol, Cardiff, Glasgow, Leeds, Liverpool, Manchester, Newcastle, Nottingham and Sheffield.

was required to accommodate a large part of the data which pointed to a further need to understand how these activities were situated not just in place but also in time. Therefore, additional categories were added to include *temporal* and *process* aspects of the data.

Rather than present the findings in the form of separate case studies, we instead look across the different cities to identify cross-cutting themes on how activities related to municipal energy are emerging as a result both of the different local pathways within the individual cities, and through the relationships between these cities.

4 Results

The following sections analyse the routes to MECs taken by the five cities over the period 2013–2017 with a particular focus on how these routes have changed over time. Sections 4.1 and 4.2 outline the motivations of cities for engaging in the energy system and the scope of this engagement. Sections 4.3 and 4.4 look in more detail at place-specific and dynamic factors that have shaped cities' activities over time.

4.1 City motivations

Motivations for engaging strategically in the energy system vary significantly between cities and were very specific to the circumstances of individual cities; so are very place specific. However, motivations identified by interviewees could be broadly grouped as environmental, economic and social and further subdivided as shown in Figure 1.

Motivations were not static over the period of analysis. For example; environmental motivations were cited as important to many of the cities during the original interviews in 2013/14, particularly in relation to carbon emissions reduction.

“And obviously, economics have taken over and things like that. However, we can say with some kind of confidence that what is your key driver? Okay, CO₂” (2014)

However, the importance of this motivation had diminished by 2017, when economic and social motivations had taken a higher priority. This could, in part, be attributed to a reduction in incentives for low carbon energy, leading to a re-framing of energy initiatives:

“the politics of it all is that all the projects that were going ahead when you could make quite a bit of money out of doing solar and wind and so on in the subsidies, that’s all been smashed...” (2017)

But it was also part of a wider change in response to recent budget cuts:

“a lot of the questions we were getting a few years back were around green agenda, councils saying we want to be more environmentally friendly, we want to reduce carbon and there may be some opportunity to make some money in and reduce costs. But a lot of it was around the environmental question. Now, with the cuts that the councils have had, now it’s all about making money” (2017)

Figure 1: Motivations for engaging with the energy system and potential scope of engagement
(Figure 1 here)

There was also a broader change in focus away from playing a part in a systemic shift in the energy system and ‘taking on the Big Six energy companies’² towards identifying how engaging with the energy system could help cities to deliver on their own strategies and services. Cities’ motivations have consistently been driven by the need to undertake projects that directly contribute to core services.

“But we still have the responsibility to residents, at the end of the day. That’s actually what we’re here for”. (2014)

However, this was initially tempered by a real focus on remunicipalisation of energy:

“[We] want to disrupt the market. I don’t know if we can. I don’t know if it’s possible, but that’s what we want to do.” (2014)

Whilst this disruptive driver remains for some of the more advanced cities, the majority of interviewees in 2017 were more driven to consider how engagement in energy would improve quality of life and economic growth. There was far greater emphasis on developing solutions that deliver core services or priorities rather than setting up energy projects for their own sake.

It is clear that while motivations vary significantly between cities, they are consistently and substantially different to the motivations of traditional energy companies. Cities are using energy to deliver essential services and place-specific outcomes, rather than aiming to deliver energy at least cost.

4.2 Scope of engagement

The scope of cities’ engagement in the energy system has changed dramatically over the period of analysis from a dominant focus on low carbon generation to one of energy supply. This is partly driven by cities refocussing on the role of energy in delivering essential services. . However, there is also a sense that they have exhausted the potential of opportunistic and short-term projects and that a more strategic, ambitious and longer term approach is needed.

This move towards a more strategic approach has been further driven by changes in policy support. A large proportion of municipal initiatives in 2013/14 were in the area of energy efficiency and decentralised generation (such as solar PV) and the activities that cities prioritised were to a large extent driven by central government funding, grants and subsidies. In the wake of dramatic cuts to these incentives there has been a move away from demand reduction and generation, into energy supply, which is less reliant on government funding but more subject to complex economic regulation.

This presents a different set of challenges to cities and affects the extent to which they are able to engage in the energy system. The complexity of regulatory systems, which were designed to replicate competition in a geographic monopoly and to prevent market manipulation by large, private sector organisations, can make it seem impenetrable to smaller organisations. The cost of setting up as a licenced supplier may be prohibitive for those who want a limited number of customers and no arrangements exist to allow supply at smaller scale.

“you know, energy companies don’t have margins unless you were a very cleverly vertically integrated company so it’s quite hard if people think that you can immediately have a tariff that’s, you

² The ‘Big Six’ is a term used colloquially in the UK to describe the six largest energy supply companies, who together supply gas and electric to over 90% of the market.

know, significantly cheaper....It doesn't seem to be working that way, there's a lot of kind of fixed costs that are put on there" (2017)

This can limit the potential for cities to engage fully, for example, participating in supply through a White Label arrangement³, rather than a full supply company, which could limit the control they have over MEC outcomes.

4.3 Drivers of change

When analysing the results we found that the activities that cities undertook to engage in the energy system were shaped by a range of factors beyond just the motivations described above. We have defined these factors of drivers of change. We found that they could be grouped as place-specific factors, including local characteristics (the material, political and organisational factors identified in section 3.2) and as external factors, which include changes in policy and context over time.

4.3.1 Local characteristics

Material factors: A successful strategy to engage in energy relies heavily on building on existing services or partnerships.

"It's about looking for complementary projects, can things be joined up and if they can then that's better than just doing it for the sake of it, so it starts with looking at what we have already got, because that's often a cheaper and a quicker way if things can be delivered through existing partnerships" (2017)

Building on existing infrastructure and assets is preferential both because it enables building on existing expertise and reduces investment risk:

"I think there's a number of things really. One is again about history, it's having that asset base, that if you were already running a district heating company you kind of know what you're doing and you have the skills and the knowledge to be able to then spot the opportunities that others might not (2017)

In the absence of already having an energy related asset background, connections are made to other kinds of assets which provide suitable links for energy initiatives. For example, social housing is an important asset used to "de-risk" energy activities by testing new services in an area that directly contributes to core service delivery whilst building expertise and evidence in support of a business case:

"default is to go around social housing because they've got much stronger control over that and that can de-risk some projects slightly... it tends to be how LAs manage some of the risks to go out and offer a much wider offer. ..Getting a service into the private owner occupied market, that service is normally borne out of a service being delivered to the social housing stock" (2017)

Political factors: Large energy initiatives need political support and in order to achieve that links need to be made to embed energy into existing political priorities. Whilst some LAs have councillors and chief executives who are specifically pushing the energy agenda, and refer to this as a significant factor, in other places the work of translating existing strategies and policies into energy initiatives in order to achieve political support is ongoing.

³ A white label provider is an organisation that does not hold a supply licence and instead partners with a licenced supplier to offer gas and electricity using its own brand.

“I think part of it then is about leadership both political leadership that we have – a few councillors who are steeped in this and really drive it forwards but also officer leadership, so our corporate director is really pushing the commercialisation agenda and because we know what we’re doing on energy it’s like that’s an opportunity actually and you only take that by growing. ” (2017)

A lack of political support at the national level has significant implications for MECs:

“...they are not creating the framework that makes it easier to work in, really...They don’t seem to understand small energy projects.” (2017)

Organisational factors: The degree to which LAs have the appropriate capacity and skill needed to establish municipal energy companies varies greatly. The cities who are already engaged in different kinds of MEC all emphasise a certain degree of fortuity that they had individual officers or councillors who had previous energy experience or training which enabled them to push this forward.

“And the chief executive of [this project] ... was just a very driven person with a long history in the energy sector, so had the skills and the drive to keep it going” (2017)

It is important to not only have the right officers but also to have appropriate and consistent connections with different parts of the council.

“I’ve been here for two years or so, the scope of the energy innovation manager is now getting broader in response to technology that’s coming through. It’s not just about energy. The stuff I do has a knock-on effect into buildings, has a knock-on effect into transport, so it’s becoming a bit more rounded rather than specific just energy” (2017)

Energy is not a core service, so is vulnerable to restructuring and lack of continuity in staffing both as a result of budget cuts and as a result of changing political priorities. As an illustration of this we were only able to interview staff at two of the five LAs twice over the period of this study, as new members of staff, often positioned differently in the LAs had taken over the remit of municipal energy by the time we carried out the second set of interviews.

4.3.2 External factors

In addition to place specific factors, the evolution of MEC was found to be strongly shaped by, the changing external socio-political contexts. There were some major changes in both policy (removing subsidies) and context (e.g. the launch of the first LA owned energy supplier in Sept 2015 (Dann 2015)) between the two sets of interviews which has a marked effect on the nature of activities undertaken and the ambitions for future activities.

In order to respond to these policy changes some councils try to anticipate future direction of national policy. But there is an increasing recognition that in order to become more resilient to the volatile policy environment it would be beneficial to move away from reliance on grants and incentives and become more self-sustaining.

“but we’re not after any grants and we’re expected to generate an income from it which means that even in a time of great pressure if you can go with a business case to say we expect to pay £130,000 but we also expect to break even within three years and by the way we’ll deliver x, y benefits to the local area” (2017)

However, the lack of a subsidy-free business models for demand reduction (and to some extent low-carbon generation) has meant that cities are increasingly engaging in the regulated areas of the energy system, such as energy supply. This presents different kinds of risks, particularly associated with entering a famously volatile energy market.

“...then ultimately in probably November/December just gone, it was decided that it is too financially risky to enter the market at this time, too many unknowns, too uncertain, and so we are not going to at this moment in time create an energy company” (2017)

This market had changed significantly between the two sets of interviews with the entry of the first LA supply company and several smaller supply companies. However, this opening up of the market increased competition from other independent suppliers and the potential for market saturation was perceived as a risk in itself:

“the market has suddenly become very crowded and ultimately the market will not sustain that level of competition. So that’s another big risk” (2017)

4.4 Processes of change

The cities’ navigation towards MECs has not been planned but rather has been an incremental process of experimentation and learning. Individual activities might not necessarily represent a systemic shift, but they are important stepping stones. For example white label arrangements are not as ambitious as fully licenced supply companies, but they provide an important, relatively low risk entry and focal point from which the cities further develop energy capacity and strategy, by adjusting and developing from an existing initiative.

“Yeah, it’s very early days regarding how [the White Label] could evolve, become a more embracing ESCO at some point in the future or as you say, there could be separate special purpose vehicles to deal with you know other energy issues. It’s hard to say.” (2017)

However, experimentation in a very risk averse and politically driven organisation is difficult, particularly in the light of recent budget cuts. Although the current economic climate has not stifled experimentation completely, the experiments undertaken in the cities are smaller and more incremental.

“A few years ago when councils had more resources you might have seen mistakes made then but I would say you’ve got to be very careful these days because any major financial error would probably kick you out of power as a politician and may well get you the sack if you’re an officer” (2017)

The process of learning from the experience of other Core Cities also shaped how the five cities moved towards MECs. The cities are, in a number of ways, in competition with each other. However, rather than all cities engaging in the same exercise simultaneously, it makes sense for some cities to “test the water” and develop experience around a certain project, from which other LAs can then learn. Waiting is, at certain stages, an important strategy.

“[Those cities] are doing all the hard work on a municipal energy company that will be a challenger to the Big Six. We’ve looked into whether we want to get really heavily involved with that and decided that what they’re doing, if it’s successful then we can tap into that, there’s no point in duplicating the effort” (2014)

5 Discussion

In this section we put forward a framework, based on the findings described above, to support a better understanding of why and how municipal energy companies form. We then illustrate how this framework can be used to inform policy with an example of identifying how national policy could better support MECs and to maximise their contribution to climate change mitigation in cities.

5.1 Framework for understanding the evolution of MECs

It is clear from this research that no two MECs will be the same but that the institutional form is a consequence of the characteristics of a particular city and the factors that drive decisions around energy (and more generally) in that place. However, that institutional form emerges from a series of activities that are assembled over time and this emergence is shaped by internal processes of experimentation and learning rather than a clear blueprint. It is this process of assembly and the resulting institutional form that we call *pathways*. Importantly, pathway development is strongly influenced by the external context, particularly policy and regulation. This framework is illustrated in Figure 2 and described in detail in subsequent sections. It is intended to improve understanding of the evolution of MECs and could be used to underpin a city's energy strategy or to evaluate the potential of policy or regulation to better support a city's strategic engagement in energy.

Figure 2: framework for understanding the evolution of municipal energy companies

(Insert figure 2 here)

5.1.1 Place specific characteristics

The results highlighted the importance of a city's assets, such as a district heating network, to act as a springboard for energy activities, building momentum from the skills and competencies that are currently available. But the role of place in shaping energy initiatives goes far beyond the presence of physical assets to include the historical, cultural and geographic resources available to a city (Rutherford and Coutard 2014, Hansen and Coenen 2015). Furthermore, LAs in the UK have very different organisational structures and decisions about major investment in or engagement with energy cuts across a number of existing structures. The success of a MEC is reliant on creating appropriate organisational space for it, which will vary significantly between cities (Hodson et al. 2013). It is important that we pay more attention to the characteristics of a city and the role of place more generally when considering how to set up, or support MECs (Hannon and Bolton 2015).

Politics and leadership matter to MECs. Cities that have implemented a major energy project have political support from elected members and strong leadership at the officer level. That's not to say that nothing can happen if these conditions aren't present, just that a strategy might have to be more incremental and more closely aligned with existing services if they are not. The continuity of leadership at both a political and officer level is crucial to MEC development, and also has a significant effect on the speed and scale of change. Understanding the political characteristics of a city then becomes crucial to understanding how MECs might emerge.

5.1.2 Place specific decision drivers

Cities have a diverse range of motivations for engaging in energy, many of which relate strongly to their unique characteristics; for example the strong focus on fuel poverty recorded in cities with high levels of social deprivation. There is little consistency between cities and it is clear from this longitudinal analysis that these motivations can change subtly but significantly over time. It is important to understand this spatial and temporal variation and the place specificity of motivations (and associated outcomes).

There has been a great deal of rhetoric about the potential of cities to transform the energy system (RTP Engine Room 2015, Hannon and Bolton 2015). However, few cities engage with energy for the purposes of changing the system. Rather, they engage with energy to the extent to which it can deliver core functions and service delivery. This means that decisions around energy are driven by a complex range of factors which can make business cases more difficult to articulate. It is important

that these additional decision drivers, many of which will be non-monetary, can be captured so that LA energy activities can be compared with more traditional activities or with energy projects designed solely to deliver revenue (Bale et al. 2012, Busch et al. 2017).

LAs are understandably risk averse and the avoidance of both financial and reputational risk drives decisions and decision processes. The failure to deliver a service or 'break even' has far greater consequences than in the private sector so risk is a far more significant driver of decisions. In the current economic climate activities that create even short-term financial risk are unacceptable, even if they lead to long-term savings or delivery against core objectives. Risk is considered and managed in very different way to the private sector; not just what is at risk (citizen services) but how that risk can best be managed (usually avoiding it). It is important that this different approach to risk definition and management is taken into account in regulation and policy intervention.

5.1.3 Pathways

The pathways that a city takes towards a MEC is shaped by their unique characteristics and decision drivers. However, the external context (both of policy and the energy system) has a significant influence over these pathways. Historically, cities have aligned strategies with favourable incentives, such as FITs and Green Deal, which generated revenue and made the business case to engage a very straightforward economic one. Cities could engage with energy activities at no cost and deliver of some of their own objectives (such as low carbon and fuel poverty). However, the sudden removal of these incentives had caused a dramatic change in direction in the pathway that many LAs are taking, away from demand reduction and low carbon generation towards energy supply. It is likely that this shift in focus would not deliver the same level of carbon reduction in cities, as changing the organisations that supply energy does not in itself decarbonise the energy generated or reduce demand.

Perhaps more significantly, this is driving a change in strategy for many LAs towards activities that are commercially viable without government incentives. This has had an effect on the potential outcomes of their engagement – initially they were driven by what government dictated (i.e. low carbon) but are now dictated by what is commercially viable. This has important implications for motivations where there is no clear way to generate revenue (such as low carbon or demand reduction) which could be overlooked in favour of those outcomes where there is a clearer economic case. It is important that we recognise the role of policy in driving this strategic change and consider how motivations without clear revenue streams can be promoted.

Experimentation has been crucial to building capacity in energy and particularly in demonstrating how energy can contribute to core services (especially where there is no clear revenue stream to allow a traditional economic case to be built). This has become a particular problem in the face of policy volatility. There is a crucial role for policy-makers to enable LAs to balance experimentation with risk management.

Iteration and incrementalism are crucial ways in which LAs can manage risk but rely on cities taking small and place-specific steps. This increases the variation in potential activities and pathways that could be implemented, indicating that standardisation is unlikely to reduce risk. It also requires policy-makers to acknowledge that incremental activities could equally result in radical change as more obviously transformative activities (Marsden et al. 2014).

Learning and interaction with other cities, and other intermediaries (Bush et al. 2017), have helped to accelerate change and build capacity in creating city-specific pathways to change. Creation of an environment that stimulates learning and encourages interaction is important to accelerate current progress.

5.1.4 External context

The pathways that cities develop towards MEC are strongly influenced by the external context and particularly by the policy and regulatory context. Policy and regulation can constrain the type of activities that cities can undertake, for example by limiting their engagement in energy supply as a result of complex regulatory environments. It can also limit the ability of activities to deliver on cities motivations, for example, by incentivising housing retrofit that delivers the highest carbon savings at the lowest cost, rather than promoting retrofit that tackles fuel poverty or contributes to local economic development. These constraints should be considered when trying to develop policy to better support MECs, which could be ineffectual if constraints are not removed.

Rapid changes to policy can have a detrimental effect on a city's ability to develop long-term plans and on the business cases for MECs. This reduces the ability of cities to manage risk, which is a key driver of decisions in cities, and further limits their potential to engage in a way that delivers on place-specific objectives. A more consistent policy context would significantly reduce the risk of cities engaging in the energy system. This is not to say that policy should be static, but that it should be coherent and give clear signals of future intervention.

5.2 Supporting municipal energy companies to deliver climate change mitigation co-benefits

MECs do not automatically contribute to climate change mitigation and it is clear from this research that changes in government policy have disconnected the link between cities' engagement in the energy system and climate change mitigation. In this section we illustrate how the framework presented in section 5.1 could help to explore how the two issues could be better aligned and how MECs could maximise their contribution to climate change mitigation.

Understanding the characteristics of an LA: The ability of a city to engage in energy activities in a way that also contributes to climate change varies dramatically depending on their local characteristics. Some cities may need to undertake intermediate activities, such as setting up a white label (rather than becoming a fully licenced energy supply company and investing in low-carbon energy generation directly), that build capacity for subsequent activities that contribute more directly to climate change mitigation, such as enabling low-carbon generation. These intermediate activities, which do not in themselves directly contribute to reducing carbon emissions, but which are crucial stepping stones to, or keep options open for, future climate mitigation activities could be described as a form of passive provision. This type of activity requires a new form of valuation which recognises the benefits of intermediate activities in opening up future options that will contribute to outcomes such as climate change mitigation (Brown and Robertson 2014).

The final institutional form of a MEC will vary significantly, depending on each city's unique characteristics. Their ability to create an MEC that is unique to their locality and also contributes to mitigating climate change is dependent on national policy that recognises and enables institutional diversity and incentivise city-level carbon reduction activities.

Understanding decision drivers: Climate change mitigation needs to align with core services and other LA priorities and not create additional costs. This presents a significant challenge whilst climate change mitigation and many other less tangible outcomes of energy activities cannot be monetised (either because the value doesn't accrue to the LA or because it accrues in the future). This is exacerbated because at the city-level there is no economic mechanism to address the externality of carbon emissions e.g. a carbon price. This requires a new approach to accounting and valuation that is able to capture and assess these outcomes on a more equal footing with monetary outcomes. This should be supported by more effective decision support tools which enable cities to better embed social and environmental benefits offered by MECs into traditional decision making processes.

Understanding pathways: Enabling cities to become more strategic, rather than being driven by financial incentives or commercial activities could increase their potential to deliver multiple social and environmental benefits, including climate mitigation. These goals are frequently cited as important to cities at the outset of a project but are often dropped throughout the decision process in favour of economically-focussed outcomes (Bush et al. 2016). This could be addressed to some extent by valuing passive provision, recognising institutional diversity and appropriately valuing social and environmental outcomes. Enabling experimentation at a small-scale to build strategic vision would allow cities to identify how best they could deliver core services and contribute to climate change mitigation, freeing up their latent capacity to act (Hodson et al. 2013).

6 Conclusions and policy implications

Cities are already engaging in the energy system and there is great potential for this engagement to contribute to mitigation of climate change. The fundamental purpose of cities engagement in energy is different to traditional energy companies; cities are using energy to deliver essential services and place-specific outcomes, rather than aiming to deliver energy at least cost.

The scope of an individual city's engagement is very dependent on their unique set of geographic, historical and political resources (their characteristics) and on what they are trying to achieve through this engagement (their decision drivers). This means that there is a great deal of diversity in why MECs are being formed and what they are designed to do.

In this research we analysed cities' attempts to develop municipal energy companies over the period from 2013-2017, which gives us a unique perspective of how cities' motivations and activities had changed over time. This highlighted the importance of the process of MEC creation, not just what the MEC was intended to do. We found that there was no blueprint for a municipal energy company but that cities were incrementally developing a series of smaller scale activities that helped them to engage in a low-risk way and to explore the most appropriate institutional form for a MEC. This experimentation and pathway creation further increased the diversity in the nature of MECs and how they came about. It also served to manage risk, which is a crucial decision driver for cities in the UK.

Understanding change over time also highlighted the crucial influence of changes in the external context on municipal energy company formation and particularly on their potential to contribute to climate change mitigation. A significant reduction in incentives for demand reduction and low carbon generation means that these activities are no longer able to generate stable revenue streams. This has driven cities to focus on more commercially viable activities, such as electricity supply, which are less likely to deliver emissions reductions. We find that policy intervention has actually reduced the potential of MEC to contribute to climate change mitigation.

As a result of this analysis we propose a framework for understanding the evolution of MECs, which highlights the importance of place-specific attributes and the dynamic elements of forming pathways towards MECs. When using this framework to assess how policy and regulation can maximise the contribution of MECs to climate change mitigation we find that it is crucial that regulation and policy making is able to recognise different decision drivers (including climate change mitigation) and enable different institutional forms. This should be underpinned by new approaches to accounting and valuation that capture and assess social and environmental outcomes and enable the valuation of intermediate activities that are essential in delivering long-term change. Finally, enabling experimentation to build strategic vision is crucial for cities, where risk management is a key constraint to long-term change. This could encourage cities to explore and exploit the

opportunities presented by deeper engagement with the energy system in a manner more likely to contribute to climate change mitigation.

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